SECTION 5

THE ECONOMIC COST

OF POTENTIAL HAZARDOUS WASTE MANAGEMENT

This section examines the potential cost to facilities and selected segments of the mining industry if EPA were to regulate mining and beneficiation wastes under the hazardous waste controls of Subtitle C of RCRA. The cost study on which these estimates are based was restricted to five major metal mining segments (copper, lead, zinc, silver, and gold), and covered mines currently active in 1984.[1] The estimates do not cover mining segments in which there are potential hazards from radioactivity or asbestos, although studies assessing the cost of reducing exposure to radioactivity are underway.

To examine potential costs that might be imposed on the selected metal mining segments, the Agency constructed eight hypothetical regulatory scenarios differing in degree of impact. These scenarios utilized combinations of four different sets of management standards, varying in stringency, and two different sets of hazardous waste criteria for determining which waste streams would be regulated. The estimated incremental costs reflect the added expenditures that facilities and industry segments would incur above and beyond the cost of current waste management practices.

The results are tentative, since they are based on only a sampling of sites, very general engineering cost evaluations, and various hypothetical regulatory scenarios. Nevertheless, the estimates do provide a first approximation of the potential level and variation of cost under the specified assumptions. They do not evaluate broader economic effects such as implied mine or mill closings, employment losses, price changes, or international trade effects.

The subsections below describe the methods and summarize the results.

5.1 COST METHODOLOGY

To estimate the costs of potential regulation, EPA (1) established criteria for determining whether waste is potentially hazardous; (2) developed hypothetical alternative regulatory standards for waste management practices with different degrees of stringency; (3) estimated the incremental cost of imposing those standards at a large sample of mining facilities; and (4) extrapolated these results to the universe of applicable mining facilities in the segments covered by the study.

The cost study focused only on currently active (1984) "major" mines--i.e., mines generating greater than 10,000 short tons of ore per year, except for gold and silver operations where a lower production cutoff was used. For the five metal segments studied (copper, lead, zinc, gold, and silver), the study results cover approximately 190 active mine sites representing an estimated 95 percent of the total active mines and 99 percent of the total amount of waste currently generated in these five segments.

EPA established two levels of criteria, referred to here as Scenarios A and B, for determining whether waste is hazardous. EPA also defined four levels of regulation, varying from imposing full Subtitle C regulations (most stringent) to imposing only a basic maintenance and monitoring function (least stringent). Combining the two hazardous waste scenarios and the four regulatory standards resulted in eight different scenarios.

To estimate the additional cost of each of these eight scenarios at specific sites, EPA (1) identified the capital and operation and maintenance needs for each scenario; (2) developed engineering cost functions reflecting these requirements; (3) established a data base with all the necessary information (e.g., waste volumes, acreage, perimeter distance, current waste management practice) for estimating costs from the cost functions; and (4) applied information from 47 specific mines to the cost functions to develop the incremental costs at those sites.

Finally, EPA extrapolated the site-specific results to the universe of mining waste to develop industry totals. It did so by projecting from the site-specific cost by industry segment (copper, gold, silver, lead, zinc), by waste operation (mine waste, leach operation, tailings), and by scenario. The distinguishing feature of this approach is that the costs reflect real-world, site-specific data.

5.1.1 Hazardous Waste Criteria

Regulated waste volumes depend on the criteria selected for determining whether wastes should be regulated, and EPA used the basic waste characteristics described in Section 4 to specify which waste streams should be considered as potentially hazardous for costing purposes, creating two sets of waste: "A" and "B." (Estimates of the volume of potentially hazardous wastes are discussed in Section 4.2.)

"A-Scenario" Wastes include waste streams meeting the Subtitle C tests for EP toxicity and corrosivity. In addition, they include gold mine tailings wastes from cyanide-process metal recovery operations (originally promulgated as interim final Subtitle C listed hazardous wastes prior to the Section 3001 exemption).

"B-Scenario" Wastes include all wastes under the "A" list, as well as:

- Gold and silver heap leach operations (because of cyanide content);

- Wastes with high acid formation potential--i.e., those found to contain high sulfides (mainly pyrites) and low carbonate or other buffering mineral content (as defined in Section 4); and

- Copper dump leach liquids (because of acidity). The "B" list of wastes represents a range of mine waste characteristics of concern over and above the hazard characteristics already contained in existing EPA hazardous waste regulations as expressed by the "A" list. The Agency examined the "B Scenario" list to be able to explore, quantitatively and systematically, the waste quantity and management cost implications of regulating these additional wastes of concern.

5.1.2 Regulatory Standards

EPA structured four regulatory alternatives for different levels of waste management practice. The regulatory alternatives covered a range of variations on Subtitle C management standards, ranging from the full set of standards at one extreme to a much more modest program of basic preventive maintenance and ground-water monitoring at the other end of the spectrum.

The Full Subtitle C Regulatory Scenario (Scenario 1) provides for a full application of current EPA hazardous waste regulation to potentially hazardous "A" or "B" mine waste, leach piles, and mill tailings. For present costing purposes, it represents a maximum cost strategy, including: a security fence around the perimeter, capping of both existing and new waste sites at closure, corrective action via interceptor wells for existing waste amounts (assuming 10 percent of the sites need them), and liners for all new waste piles, leaching areas, and tailings ponds. It also requires activities common to all of the alternative management strategies:

- Permitting;
- Surface water run-on and runoff diversion/collection ditches (mine waste only);

* Ground-water monitoring wells and testing;
    * Leachate collection ditches; and
* Post-closure inspection, drainage maintenance, and ground-water monitoring.

The Tailored Standard Scenario (Scenario 2) represents an intermediate cost alternative. This scenario includes the five common activities listed above. However, the waste management technique here is distinguished by substitution of waste treatment processes where considered feasible--namely, the removal of cyanide from gold and silver tailings and removal of sulfides (pyrites) from copper mill tailings. The scenario assumes that all sites would require interceptor wells because it assumes a 100 percent failure rate for all waste sites, except for treated wastes at gold and copper sites (treatment is the alternative to interceptor wells).

The Corrective Action Scenario (Scenario 3) also represents an intermediate alternative with to regulatory standards that are less stringent than those embodied in Scenario 1. The applicable activities are identical to those listed under Scenario 2 (including the 100 percent failure assumption), with the exception that cyanide is not removed from gold and silver tailings, and sulfides are not removed from copper mill tailings.

The Basic Maintenance and Monitoring Scenario (Scenario 4) includes only the five activities common to the other scenarios. By design, this represents a least-cost scenario consistent with providing a measure of protection against surface water contamination and a first warning of any offsite movement of contaminated leachate. It can also be regarded as the first stage of a corrective action strategy.

Combining the four regulatory standard alternatives with the two alternative sets of potential hazard criteria yields eight possible levels of cost. Table 5-1 summarizes the definitions of costing scenarios in terms of their alphanumeric designations: the numbers 1 through 4 represent the alternative regulatory standards, and the letters A and B represent the applicable potential hazard criteria.

5.1.3 Estimating Incremental Costs at Specific Sites

EPA identified the cost elements required for each scenario. Cost elements are the individual capital requirements, and individual operation and maintenance requirements. EPA also developed engineering cost functions for each cost element for performing the activities that the management standards require. EPA then created a data base for 47 mining facilities that incorporated the information necessary to calculate costs from the engineering cost functions. This included identifying the current waste management practice (baseline practice) at each of the 47 sites. This information was necessary to develop incremental costs that reflect the costs of practices required under each of the four regulatory standards above and beyond the baseline practice. In addition, the data base incorporated information relative to site-specific geography, product production, total waste quantities, waste quantities that would meet the hazardous waste criteria, type of industry, and type of waste operations. Finally, EPA computed the incremental cost for each scenario at each site by applying the data base information to the engineering cost functions.

5.1.3.1 Cost Elements

As discussed previously, imposing various degrees of regulation requires a different mix of outlays for capital, operation, and maintenance. The mix of cost elements varies by the stringency of the regulatory standard. For convenience, Table 5-2 summarizes the cost elements included in each of the four regulatory standard scenarios. A discussion of each element follows.

Table 5-1 Definition of Costing Scenario

Variations by specified hazards	Variations by type of regulatory approach
	1. Full Subtitle C Regulations
"A" SCENARIOS: Subtitle C Definitions:	2. Tailored Standards (varying by type of hazard)
• EP Toxicity Characteristic • Corrosivity Characteristic • Cyanide Gold-Mine Tailing. Liquid Waste	3. Corrective Action 100% failure bracket
"B"SCENARIOS: Subtitle C Above, Plus:	
• Cyanide Toxicity Characteristic • High Acid Generation Potential Characteristic • Copper Dump Leach Listing	4. Basic Maintenance and Monitoring Zero failure bracket

Table 5-2 Summary of Cost Elements Included for Each Scenario

Cost element	Regulatory scenario 1	2	3	4
1. Permitting	X	X	X	X
2. Leachate system	X	X	X	X
3. Monitoring system	X	X	X	X
4. Run-on/runoff system	X	X	X	X
5. Post-closure maintenance and operation	X	X	X	X
6. Site security	X			
7. Liners (new waste only)	X			
8. Closure cap	X			
9. Tailings treatment (for copper and gold)		X		
10. Corrective action via interceptor wells	X[a]	X[b]	X	

Note:Explanations as to variations between and within scenarios are contained in the text.

a Only for existing accumulated waste sites (that were closed at time of RCRA implementation).

b Exceptions: gold and copper tailings (subject to treatment instead).

Permitting. Mining operations with hazardous wastes would require RCRA permits. Permits would be based on geological and engineering studies describing the plan for managing wastes and containing or treating contamination. Incremental costs in this study vary among states with more advanced permitting requirements and those with less.

Site Security. RCRA regulations require that security be provided to prevent the general public and livestock from coming into contact with hazardous waste. For this study, EPA assumed that operators of facilities would install and maintain cyclone fences around all hazardous waste areas during their active lifetime and a 30-year post-closure period.

Caps and Liners. RCRA Subtitle C rules require caps when disposal sites are closed and that new waste landfills and impoundments be lined. The cap assumed for this study consists of vegetation, topsoil, clay or sand, polyethylene cover, and clay. We assumed that liners were composed of a combination of clay and synthetic liner materials.

Monitoring Wells. RCRA rules require ground-water monitoring of hazardous waste disposal sites. The study assumes that wells will be located around the general perimeter of each waste disposal operation (500 feet between each well), and that four replicate samples will be taken and analyzed twice a year for appropriate contaminants.

Run-On and Runoff Systems. Regulations provide that precipitation be directed around hazardous waste piles to avoid leaching of contaminants. Runoff from surfaces of piles must also be controlled. The costs here reflect primarily ditching and flow control systems.

Leachate Collection Systems. RCRA rules require a system to collect and treat contaminated seepage from hazardous waste piles. A full system includes: (1) ditches or trenches on the downgradient sides of the waste pile;

(2) an intermediate liquid storage system; and (3) a chemical treatment plant.

Corrective Action via Interceptor Wells. At some sites, contamination migrates into ground water, forming a plume that can migrate from the site. When this happens, RCRA Subtitle C rules require corrective action. For this study, EPA assumed that interceptor wells would be installed in the plume, or at the downgradient edge of the plume, to pump the contaminated water to the surface. EPA assumed that all contaminated water would be sent to a treatment plant. In Scenario A, interceptor wells are installed at closure only for existing waste.

Tailings Treatment. This applies only to Scenario 2 where treatment of new waste is employed when feasible rather than interceptor wells. Specifically, EPA assumes that future gold and copper ore tailings would be treated to separate out pyrite concentrates for disposal as a hazardous waste, using a flotation circuit, and that a treatment plant would be installed to destroy cyanide in gold beneficiation operations.

Closure. When the useful life of a waste pile or tailings pond is over, the study assumed the site would be capped with impervious cover material. The design and cost of the cap depends on whether the waste site is from past operations or future operations.

Post-Closure. Operation and maintenance (O&M) costs are assumed to be incurred for 30 years after closure. The annual O&M costs would consist of several elements: (1) maintenance of the cap and fencing; (2) inspection; (3) detection or compliance monitoring; (4) maintenance of the run-on and runoff systems; (5) operation of the leachate collection; and (6) operation of the interceptor well/treatment system.

Financial Assurance. RCRA Subtitle C rules require firms to demonstrate that they can meet closure and post-closure costs. They may do so by posting surety bonds, by purchasing a letter of credit, by establishing a trust fund, by purchasing an insurance policy, or by passing a financial test.

5.1.3.2 Cost Functions

Engineering cost functions were developed for each of the waste management practice cost elements listed in Table 5-2. The functions generally take the form: $C = aV^b$, where C = cost, a = a constant, V: the volume of waste, and b = the elasticity of cost with respect to volume (which shows how cost changes as a result of small volume changes). Many of the functions use the number of acres or perimeter distance as the independent variable rather than waste volume. Permitting costs are based on type and size of mine, as well as current State agency permitting requirements.

5.1.3.3 Sample Facility Data Sources

The Agency's cost study utilized and built upon a mine facility data base providing site-specific data for 47 metal mining properties, with information on geophysical characteristics, mine/mill technologies and efficiencies, historical production levels, and other salient factors.[2] Additional site-specific data were assembled on the type and size of current waste management areas and practices, as well as life expectancy of ore bodies and current production cost factors. The data were supplemented by survey information on current State mining waste regulations. These data provide the primary inputs for estimating historical and current mine, tailings, and leach pile waste generation rates as well as simulating baseline management practices at each of the 47 properties.

EPA waste characteristics sampling data were available for one or more waste streams at 41 of the 47 facilities; and the combination of these two data sources then formed the basis for calculating potentially hazardous waste quantities and incremental hazardous waste management compliance costs for each database facility under the various hypothetical regulatory scenarios, using the cost functions previously described.

Appendix B provides a fuller discussion of the facilities data base, the methods used in estimating waste generation rates, and the techniques employed to extrapolate waste quantities and compliance costs from the sample sites to the segment totals for the mining segments in the study.

5.1.4 Total Number of Facilities and Waste Quantities Regulated

EPA aggregated the site-specific regulated waste quantities, capital costs, and O&M costs for each facility in the data base by industry, by scenario, and by waste operation. The resulting industry totals for numbers of facilities affected and regulated waste quantities are summarized for the specific segments in Table 5-3.

As indicated in Table 5-3, 99 out of 191 metal mining facilities (52 percent) and 67 million metric tons out of a total annual generation of 725 million metric tons (9 percent) of metal mining waste would be subject to potential Subtitle C regulation under Scenario A. However, except for gold, less than half of the facilities in any given segment would be affected. Furthermore, not all of a given affected facility's waste sources would necessarily be subject to regulation. For example, copper mine and tailings wastes were not found by our sampling to be potentially hazardous under our Scenario A definition, but some copper dump leach piles are potentially hazardous in Scenario A. This accounts in part for the relatively low percentage of waste meeting the hazard criteria, in contrast to the higher percentage of facilities. In addition, the (listed) cyanide process tends to dominate the gold milling/processing operation, but a relatively smaller fraction of total waste.

Table 5-3 Numbers of Potential RCRA Mine Facilities and Quantities of Hazardous Waste in EPA Cost Study, Scenario A and B, by Mining Sector

	Number of facilities		Annual waste generation (millions of metric tons/year)	
	Regulated/ total	Percent regulated	Regulated/ total	Percent regulated
		Scenario A		
Copper	6/22	27	50/632	7.9
Gold	75/100	75	13/65	19.6
Silver	12/50	24	1/17	5.7
Lead	3/7	43	3/9	33.3
Zinc	3/12	25	0.3/2.4	11.5
Totals	99/191	52	67/725	9.3
		Scenario B		
Copper	21/22	96	276/632	43.7
Gold	100/100	100	24/65	36.6
Silver	25/50	50	4/17	22.3
Lead	3/7	43	3/9	33.3
Zinc	3/12	25	0.3/2.4	11.5
Totals	152/191	80	307/725	42.3

Source: Estimated by Charles River Associates 1985a.

In Scenario B, the fraction of firms under regulation increases to about 80 percent overall, and the fraction of regulated waste increases to about 40 percent. Almost all copper sites (although still less than half of the total waste volume) would face regulation under this scenario, as well as all gold mines (due to cyanide heap leach and metal recovery). For silver, lead, and zinc, the fraction of facilities affected ranges from 25 to 50 percent and the fractions of waste regulated from 11 to 33 percent under Scenario B.

This methodology relies on the use of real-world sites with site-specific information concerning prevailing regulations and current waste management practices, geography, and mine operations. It requires a high level of detail in building up the cost estimates for each EPA data base site. The results presented below are based on the application of this methodology to a large sample (47) of real-world sites and the extension of those results to the remaining sites.

5.2 POTENTIAL COSTS OF RCRA SUBTITLE C WASTE MANAGEMENT

This section discusses potential costs for the metal mining industry in the aggregate, for individual segments, and for individual mine facilities if certain wastes were managed as hazardous wastes under various regulatory scenarios. The discussion also provides some insights as to the relationship of compliance costs to mine production costs.

5.2.1 Potential Total Cost for the Metal Mining Industry

EPA's cost analysis leads to three principal findings with respect to total potential cost. The first is that the waste management costs of RCRA could be quite substantial under the types of regulatory scenarios that this report considers, as Table 5-4 illustrates. In annualized cost terms, costs for the five metal mining segments would be measurable in the millions of

Table 5-4 Potential Total Cost For Metal Mining Industry[a] Under Various RCRA Regulatory Scenarios

Regulatory scenarios[b]	Lifetime[c] ($ millions)	DPVL[d] ($ millions)	Annual[e] ($ million)
1A	$2,421	$1,279	$185
2A	937	305	47
3A	1,036	332	46
4A	128	60	7
1B	9,985	5,746	854
2B	3,577	1,139	210
3B	2,809	800	118
4B	330	137	17

a Industry segments include: copper, lead, zinc, gold, and silver.

b See Subsection 5.1.1 and Table 5-1.

c Lifetime cost (1985 dollars), not discounted, including: closure and 30 years post-closure costs for existing wastes; opening and managing a new waste management facility for 15-year future operations; closure at end of 15th year; post-closure management for 30 years.

d Discounted Present Value of Lifetime Costs, as listed in note (c). Real discount rate of 9.0 percent.

e Lifetime Costs Annualized over 15-year future mine production period using a real discount rate of 9.0 percent.

Source: Estimated by Charles River Associates 1985a.

dollars per year up to several hundred million dollars per year over a 15-year mine production cycle. Lifetime costs (undiscounted) for operating the mines in five metals segments would be measurable in the hundreds of million dollars, possibly up to several billion dollars over the next 15 years of mine production.

The second major conclusion is that costs vary substantially among the RCRA management scenarios chosen for analysis. Generally speaking, the highest cost scenarios (1A and 1B) are several times more costly than the intermediate cost counterparts (2A and 3A, 2B and 3B). Similarly, the minimum maintenance and monitoring scenarios (4A and 4B) cost only a fraction as much as the intermediate cases.

The third finding is that the additional waste management cost incurred by adding additional B-Scenario wastes is also very substantial: Scenario B is typically two to four times more costly than Scenario A for given regulatory standards or strategies.

The figures presented in Table 5-4 assume that the potentially hazardous portions of both existing waste (accumulated at these sites from past operations} as well as new (future) waste generated at these sites would be managed as RCRA Subtitle C hazardous waste. If only new wastes generated in the future were to be regulated, the costs would be 40 to 70 percent of those shown in Table 5-4, depending on the scenario considered.

5.2.2 Potential Costs for Individual Segments

Potential total costs for the five individual metal mining segments vary widely among the segments analyzed and across alternative regulatory scenarios, as Table 5-5 illustrates. By far, the largest aggregate lifetime cost for each alternative falls on copper mining, because of the extremely large quantities of waste and the relatively high proportion of total waste

Table 5-5 Potential Total Costs For Selected Metal Mining Sectors Under Various RCRA Regulatory Scenarios

	Subtitle C		Tailored standards	
Sector	1A	1B	2A	2B
	Lifetime costs ($ million)[a]			
Copper	$1,400	$8,300	$400	$2,400
Gold	670	1,200	250	770
Silver	46	180	60	180
Lead	260	260	180	180
Zinc	45	45	47	47
Totals	$2,421	$9,985	$937	$3,577
	Discounted present value ($ million)[b]			
Copper	$ 710	$5,000	$ 96	$ 770
Gold	370	490	110	230
Silver	28	90	23	63
Lead	140	140	68	58
Zinc	26	26	18	18
Totals	$1,279	$5,746	$305	$1,139
	Annualized costs ($ million/Year)[c]			
Copper	$ 110	$ 740	$ 14	$ 150
Gold	48	75	17	37
Silver	4	16	4	11
Lead	19	19	9	9
Zinc	4	4	3	3
Totals	$ 185	$ 854	$ 47	$ 210

a Lifetime cost (1985 dollars), not discounted, including: closure and 30 years post-closure costs for existing wastes; opening and managing a new waste management facility for 15-year future operations; closure at end of 15th year; post-closure management for 30 years.

b Discounted Present Value of Lifetime Costs, as listed in note (a). Real discount rate of 9.0%.

c Lifetime costs annualized over 15-year future mine production period, using a real discount rate of 9.0%.

Source: Estimated by Charles River Associates 1985a.

that is of potential concern, particularly in the dump leaching and milling operations. The gold segment bears the second highest lifetime total cost since most gold production uses cyanide processes either in leaching or milling operations.

5.2.3 Potential Costs for Individual Mine Facilities

As noted previously, the number of mine facilities that might be subjected to hazardous waste regulations is highly uncertain, depending on various possible definitions of hazardous waste constituents, variations in natural mineral deposits, and differences in ore processing methods. EPA waste sampling suggests wide variations among different segments as to percentage of mines with potentially hazardous waste, as well as wide variations within individual segments regarding possible quantities and characteristics of such waste materials. This section examines potential cost implications for individual facilities among and within the five segments analyzed.

Table 5-6 provides a comparative summary of individual mine facility cost estimates for two illustrative scenarios--Scenario 1B (the highest cost scenario estimated) and Scenario 4B (the lowest cost scenario for the B-waste group). Potential costs are presented on both a lifetime and an annualized basis. For the high-cost scenario (1B) , average lifetime costs for affected facilities would range from $7 million for silver mines up to almost $400 million for individual copper mines. Annualized and discounted over a 15-year mine production cycle, these would translate into new annual average cost burdens for individual mines, ranging from $600,000 per year (silver mines) up to $35 million per year (copper mines) per facility.

The facilities with the highest costs--those with the greatest volumes of potentially hazardous wastes or especially difficult management conditions--would experience additional management costs that would be significantly

Table 5-6 Potential Incremental Compliance Costs For Individual RCRA Mine Facilities
For High- and Low-Cost Scenarios

	Scenario 1B		Scenario 4B	
	Average facility	Maximum cost facility[a]	Average facility	Maximum cost facility[a]
	.... Lifetime costs ($ millions)[b]			
Copper	390	1,300	10. 0	33.0
Gold	12	170	0.6	16.0
Silver	7	120	0.5	10.0
Lead	85	170	11.0	17.0
Zinc	15	27	3.0	6.0
	Discounted present value ($ million/year)[c]			
Copper	240	1,100	3.8	16
Gold	5	63	0.3	8
Silver	4	50	0.3	5
Lead	46	110	4.4	7
Zinc	9	16	1.1	3
	Annualized costs ($ million/year)[d]			
Copper	35.1	190	0.50	2.4
Gold	0.8	9	0.04	0.9
Silver	0.6	10	0.04	0.6
Lead	6.5	14	0.57	1.2
Zinc	1.4	4	0.20	0.5

a Maximum means the maximum cost for a facility in the EPA data base.

b Lifetime cost (1985 dollars), not discounted, including: closure and 30 years post-closure costs for existing wastes; opening and managing a new waste management facility for 15-year future operations; closure at end of 15th year; post-closure management for 30 years.

c Discounted present value of lifetime costs, as listed in note (a). Real discount rate of 9.0%.

d Lifetime costs annualized over 15-year future mine production period using a real discount rate of 9.0%.

Source: Estimated by Charles River Associates 1985a.

higher than the average. For example, in the zinc and copper segments, a high-cost facility would face costs about three times higher than the average. For silver and gold, the costs of meeting the Scenario 1B RCRA regulation would be on the order of 15 times the industry average.

Differences between the two scenarios are equally striking. Facilities employing RCRA cap and liner controls (Scenario 1B) would have 5 to 40 times more RCRA-related waste management costs over their lifetime than if they employed only the maintenance and monitoring functions estimated for Scenario 4B.

5.2.4 Potential RCRA Costs Relative to Mine Production Costs

Comparing potential facility compliance costs to total mine production costs provides insight on the possible effect of RCRA Subtitle C regulations on individual mine economics. Table 5-7 shows potential incremental compliance costs per unit of mine product (typically, concentrated ore) and potential incremental RCRA costs as a percentage of the segment's average current total direct production cost. Potential cost impacts of hazardous waste regulation for an average mine for the low-cost Scenario 4B range from about 1 to 5 percent of total production costs for the five metal segments. By contrast, for the high-cost Scenario 1B, potential incremental RCRA regulation costs would range from about 20 to 120 percent of current total direct product costs, on the average, for individual facilities in the five segments.

The high-cost mines again would experience impacts significantly greater than the average. In Scenario 1B, EPA estimates that the high-cost facilities in all five segments would face potential RCRA compliance costs in excess of

Table 5-7 Potential Incremental RCRA Compliance Costs Relative to Facility Production Costs

	Cost per unit of product[a] (Dollars per metric ton)		Percent of direct product cost[a]	
	Average for affected facilities	High-cost facility	Average for affected facilities	High-cost facility
	. . . .	Low-cost scenario (4B)		
Copper	$ 17.6	$ 44.1	1.7%	4%
Gold	5,625.5	29,466.9	1.1%	6%
Silver	267.9	1,071.5	2.5%	10%
Lead	5.4	15.4	1.9%	5%
Zinc	28.7	57.3	5.2%	10%
	. . . .	High-cost scenario (1B) -		
Copper	$ 1,212.5	$ 3,417.1	120%	340%
Gold	117,867.6	267,881.0	23%	54%
Silver	4,286.1	16,608.6	40%	160%
Lead	60.6	253.5	21%	88%
Zinc	209.4	31 9.7	39%	58%

a Direct costs of mine product are based on sector averages of current cash operating costs for facilities, as estimated by Charles River Associates for EPA. Costs do not include facility-level capital investment, depreciation, interest expense, or corporate overhead.

Source: Estimated by Charles River Associates, 1985a.

50 percent of their total direct production costs. Even under the low-cost Scenario 4B, estimates for the most-affected facilities in each of the five segments range between 5 and 10 percent of total mine production costs.

SECTION 5 FOOTNOTES

1 Charles River Associates 1985a.

2 This data base was originally developed by Charles River Associates.